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Peculiarities of using drugs in the elderly

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Abstract

Background: The global aging of the population is particularly evident in economically developed countries and has a progressive character, being in the sight of the state, government and of many international organizations. According to statistics, in this period of life, the morbidity is higher in males than females. At the same time, the need to provide medical assistance to the elderly is 50 percent higher than needed for middle-aged people. About 26% of senile patients show complications and side effects due to medications. The reasons may vary: the late doctor attendance, the socio-psychological state, polymorbidity, the chronic outbreaks of diseases, parallel treatment at other physicians', self-treatment etc. The simultaneous treatment by other physicians, who in their turn, prescribe drugs which might increase the probability of chemical and physical incompatibilities, and especially the pharmacological ones. Self-treatment is a global issue. The patient, quite often, listens to the advice of neighbors, friends, acquaintances who believe they are suffering from the same disease. So appear the different forms of polypragmasia.

Conclusions: So appear the different forms of polypragmasia. Polypragmasia is sometimes more dangerous than the insufficient treatment. Anatomical-physiological modifications of the cardiovascular system of senile patients lead to paradox effects of the administration of some drugs. Before initiating any treatment, it is necessary to determine whether the patient is using any drugs recommended by other specialists, friends, neighbors or drugs, which are not allowed to be prescribed with other drugs, in order to avoid unwanted interactions.

Key words: elderly, polymorbidity, polypragmasia, self-treatment.

Introduction

The global aging of the population is particularly evident in economically developed countries and has a progressive character, being in the sight of the state, government and of many international organizations [51].

If in 1950 the 60-year-olds would make 200 million, then in 2025 it is foreseen for them to rise 6 times, as many as 1.2 billion people [37].

Nowadays, the old patient presents a unique clinical-psychological phenomenon in terms of presence and association of pathologies according to character and manifestation, due to the involution changes of different organs and systems [9,31,51].

In the structure of the diseases of senile patients pathologies of the cardiovascular system (ischemic cardiopathy, arterial hypertension, atherosclerosis) are found most frequently; diseases of the CNS and sensory organs rank second; more rarely – diabetes mellitus, ophthalmologic diseases, vascular pathologies, gastro-intestinal diseases etc [16,19]. According to statistics, in this period of life, the morbidity is higher in males than females. At the same time, the need to provide medical assistance to the elderly is 50 percent higher than needed for middle-aged people [2,28].

Since the major role in geriatric medicine is given to the medicament therapy, the physician must constantly perfect his ability of rational tactics, to assure maximal results and minimal risks of developing complications. According to the latest data, this group of people develop adverse reactions two to three times more often than younger groups of people [32,33,35,37].

Starting the treatment, it has to be taken into consideration that patients of higher age usually suffer from three to four, ten or even twelve chronic diseases simultaneously. In this situation, there is a necessity to take several different drugs at once. Therefore, the pharmacotherapy for this category of patients demands a strict evidence of all possible medicament interactions, since both, the risk of relative overdose and the risk of side effects rise [6,14].

The presence of psychosomatic disorders contributes to the worsening of the pathogenesis, influencing the forecast and the quality of life. They make it hard to identify the correct diagnosis and to choose the most fitting method of treatment, to select the proper dose of medicament [3,13].

The treatment, including that with medicaments, is a major step that represents a permanent problem in the geriatric practice – "to treat or not to treat, how and with what?"

Younger people have more stable homeostatic mechanisms to keep the organism healthy than older people. That is why aging is characterized by the diminution of these adaptive processes [17].

About 26% of senile patients show complications and side effects due to medications. The reasons may vary: the late doctor attendance, the socio-psychological state, polymorbidity, the chronic outbreaks of diseases, parallel treatment at other physicians', self-treatment etc [4,5,12,27].

One of the important factors is polymorbidity. The administration of medications for the treatment of a disease may lead to the worsening of another one or to the development of complications. For example, a prescription with high potential in treating pulmonary diseases may provoke vomiting due to its mechanism, leading to lesions of vessels and external and internal hemorrhages. These complications require effort and expenses for the stabilization of the patient [22,34].

Chronic disease outbreaks demand the usage of medications for a long time. That is why before initiating treatment it is necessary to collect a precise "drug history"- what, for how long and what dosage was prescribed to the patient. At the same time, we need to take into consideration that not all new medications have passed the required clinical trial for this category of patients. Administering them, the doctor runs the risk of registering adverse reactions in the patient [7,11,20].

The atypical process of pathologies, and their difficult diagnosis, many times contributes to the usage of symptomatic treatment, which is often not completely effective. As a consequence of the disease's progress, saving the patient in the late stages of the disease might require major doses, which therefore increase the risk of adverse reactions even more [26,30].

The doctor should take into account a possible simultaneous treatment by other physicians, who in their turn prescribe drugs, which might increase the probability of chemical and physical incompatibilities, and especially the pharmacological ones [18,20].

Self-treatment is a global issue. The patient, quite often, listens to the advice of neighbors, friends, acquaintances who believe they are suffering from the same disease. This is how different forms of polypragmasia appear. Polypragmasia is sometimes more dangerous than the insufficient treatment. It has been determined that a simultaneous use of 6 or more medical remedies in older patients, is the reason that 80% of the cases develop unfavorable adverse reactions. Combining drugs cannot only increase the potency of the necessary pharmacological effect, but also the toxic one, which can manifest itself by increased weakness, fatigue, dizziness, sleep problems, movement issues [8,15,19]. However, doctors often attribute these symptoms to age, without thinking that they might constitute a relative overdose of drug usage.

It should be taken into account that not only the factors enumerated above can provoke adverse reactions, but also the particularities of geriatric pharmacokinetics – the path of the drugs from administration to the elimination from the organism (tab. 1).

Owing to saliva insufficiency in the buccal cavity, the medication processing is disturbed and there is a decreased ability of fermentation, as well. Under these conditions, the drug arrives in the stomach in a dry state [38].

Loss of 20% of mucosal surface may be caused by retention of absorption. This functional remodeling of the digestive tract leads to the retention of absorption of the drug followed by delay of appearance of the therapeutic effect. On the other hand, the constipation present in most of the cases, by which intestinal hypomotor is manifested, can increase the bioavailability of the drugs [41,44].

The decrease in number of capillaries and their increase of winding in patients over 60 lead to the reduction of drug absorption when administered subcutaneously or intramuscularly. Therefore, these ways of administration have to be avoided in these patients, especially oily forms [24,40].

The pharmacologic and toxic effect of the drug mostly depends on its distribution in the organism. Taking into consideration the fact that a person close to the age of 80 loses 10-15% of the circulating liquid, it leads to the decrease of microcirculation. The drug, arriving in a small volume of liquid, increases in concentration and creates an overdose. For example, after one hour, the concentration of propranolol in blood may be up to 4 times higher in older people than in younger ones [28,39,50].

The disturbance of distribution of the drug within the senile organism depends on the physico-chemical modification of the blood, the permeability of the tissues and the connection with the plasma proteins, especially with

Table 1

Peculiarities of physiological changes in older patients

Process	Character of modification	Consequences
Absorption	Reduced: formation of hydrochloric acid in the stomach, discharge velocity, TGI motility, circulation in mesenteries vessels, absorption area. The microscopic study of intestinal biopsy in the elderly demonstrated 20% decrease in mucosal surface, skin layer atrophy, reduction of capillary numbers and increase of their winding with reduction in blood circulation.	It increases the latency of the effect, increases the duration of action, more often hypoxia, intoxication
Distribution	Cell dehydration, reduced muscle tissue mass and increased fatty mass, tissue perfusion, atrophy or decreased parenchymal organ mass.	Relative overdose
Binding with plasma proteins	Decrease of albumin-concentration in blood plasma.	Increase in effectiveness of drug, often side effects
Metabolism	Reduced: liver mass, hepatic circulation, fermentation activity participating in the metabolism of the drug and contributing to the accumulation of toxic intermediate products.	Increase of duration of drug action
Excretion	Reduced degree of glomerular filtration and canaliculi secretion	Increase of duration of drug action leading to overdose

the background of hypoalbuminemia. hypoalbuminemia causes the increase of the free fraction of the drug and the formation of a toxic effect [41,49].

In senile patients the intensity of metabolic reactions of the drug in the liver decreases, followed by accumulation of intermediate substances which is toxic for the organism. At the same time, growth of adipose tissue of the liver, in which the drug deposits, creates a higher probability of manifestation of the toxic effect [19,43,44,45].

Reduction of the cortical layer by 20%, reduction of the speed of blood flow in kidneys by two times, reduction of the glomerular filtration rate by three times may retain the drug in the patient's organism. As digoxin has a half-life of 51 hours in patients of 40 years, yet in 70-year-olds it has a half-life of around 73 hours. Also, gentamicin has a half-life of 1.6 hours in 40-year-olds but of 5.6 hours in 70-year-olds [23,30,33].

Anatomical-physiological modifications of the cardiovascular system of senile patients lead to paradox effects of the administration of some drugs as papaverines, nitroglycerines. They may increase arterial pressure in older people, yet in other situations they may provoke a colaptoid effect. Barbiturates may lead to irritability; caffeine may have a sedative effect [1]. Based on the peculiarities described above, it is necessary to follow certain principles of drug administration in older patients.

Before initiating any treatment, it is necessary to determine whether the patient is using any drugs recommended by other specialists, friends, neighbors or drugs, which are not allowed to be prescribed with other drugs, in order to avoid unwanted interactions.

The dosage of the drug has to be ½ or 2/3 of the dosage for young adults taking the involution peculiarities of the organism into consideration. For senile patients, the body mass is not a criterion to determine the dosage of a drug.

To prevent polypragmasis, basic pathologies have to be determined and treated [20,49].

To avoid overdose (due to inability of the patient to break the pill in half, etc.) the way of drug administration must be easy. The dosage of the prescribed drug must be obeyed.

To prevent doubling or tripling of dosage because of memory loss of the patient, it is recommended to part the drugs in boxes for "morning", "afternoon", "evening", etc.

In order to avoid chemical interactions, the drugs must be administered with an interval of 30 minutes minimum.

To avoid ulceration of the digestive tract mucosa in older patients, acidic drugs (non-steroidal anti-inflammatory, sulfanilamide, analgesics) should be taken after meals [35,50].

To avoid physicochemical interactions, the composition of meals should be taken into consideration when administering drugs. For example, caffeine-containing tetracycline and other caffeine-containing drugs require milk and dairy products to be eliminated from the diet, in contrary when administering NSAIDs and glucocorticoids it is better to include dairy products. [7, 47, 48].

Some drugs, as iron, papaverine, atropine, are not recommended to be used together with tea or juices because these contain tannin, which deregulates the absorption of the drugs. It is also recommended to avoid fruit and vegetable juice when taking erythromycin, ampicillin and grapefruit juice when taking calcium, yet grapefruit and orange juice enhance the absorption and effect of hypnotics. Antibiotics and drugs against tuberculosis require many fruits and vegetables [29, 39].

Fatty food products are not recommended to be ingested with acetylsalicylic acid, furadonine, nitroxoline or sulfanilamide, because it decreases their absorption. However, fats are well suited for the administration of anticoagulants, vitamins A, D, E, K, diazepam and aminophylline, as fats increase the absorption of these preparations.

Protein-rich meals contribute to the increase in blood proteins, which bind to the drug to decrease the amount of free drug and the pharmacologic effect of the following preparations: cardiac glycosides, anticoagulants, sulfanilamide, quinidine, theophylline, caffeine, cimetidine, etc. Some drugs disturb the proteic, glucidic and lipidic metabolisms. For preventing these complications, proteins (cheese, fish and meat), potassium (apples, peaches, beans, carrots, peas, onions, etc.), calcium (dairy products) and vitamins are recommended [51].

Analgesics require the exclusion of smoked food. To elude complications, for senile patients administration of several analgesics simultaneously and for more than ten days should be avoided. Sometimes, the toxicity of a drug is associated with alcohol. Examples are the usage of paracetamol or acetylsalicylic acid with alcohol, which leads to an increase of the hepatotoxic and nephrotoxic effects of these drugs.

Ways of reducing unwanted effects have to be taken into consideration, too (tab. 2).

Table 2

Ways of reducing unwanted effects

Drug	Schedule of administration
Clorpromazine, Clonidine, Metildopa, Hidralazine	To lie down for 1.5 / 2 hours after administration
Piracetam,, Diuretics, Decamevit, Expectorants	Not to be administered at night
Etacrinic acid	To be administered after breakfast
Diclofenac, Dipiridamol, Complamin	To be swallow without chewing
Nicotinic acid, Nicospan	To be administered 10 minutes after meals

Last but not least, the biological rhythm, both individual and common, are taken into account for a more effective and bearable action. The importance of the biological rhythm has been demonstrated for several groups of drugs: glucocorticoids, methylxanthines, antihypertensives, etc. The action of antihistamines is of a longer duration if given at 07:00 in the morning. The best time for acetylsalicylic acid administration as an antiplatelet is 08:00 in the morning because that is when the gastroduodenal mucosa is less sensitive and therefore less vulnerable. NSAIDs are recommended between 08:00 and 12:00 o`clock. Antihypertensive medications are recommended to be given 1.5 – 2 hours before nictemeral blood pressure elevation peaks to increase

the duration of the effect of the hypotensive drug. The latter is due to the functional cumulative effect, which allows reducing the number of administrations, the cost of treatment and unwanted side effects [42, 43].

Another important factor is the socio-psychological state of the senile patient. The physician should use principles for protecting the psyche of the patient by using rational psychotherapy- explaining clearly about the disease, the possible ways of treatment, their advantages and disadvantages. Sadly, physicians often ignore the importance of this component, faulting the patient's decreased hearing and memory for the low efficiency of the treatment.

Conclusions

All this, following a self-analysis, may lead to neurotic, depressive and phobic disorders which often complicate treatment, making it ineffective. It has been demonstrated that depressive patients undergo treatment less effectively than active patients [10,25]. Therefore, it is very important for a physician to gain authority and trust in front of the patient. Markers that are necessary for the prophylaxis of a curative heterogeneity are:

- Agreement between patient and physician about the need of treatment
- Simple indications about the schedule of administration in terms of number of drugs, number of administrations and side effects
- Active implication of relatives, social workers, pharmacists, etc.

When administering drugs to senile patients the physician is always obliged to ask himself about the vital necessity of this drug to this patient at this specific time [18,21,52].

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